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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,546	02/10/2004	Seung-Beom Kim	8750-046	5443

20575 7590 12/19/2005

MARGER JOHNSON & MCCOLLOM, P.C.  
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PORTLAND, OR 97204

EXAMINER
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NGUYEN, TUAN H

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 12/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/776,546	KIM ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tuan H. Nguyen	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 16-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 and 15 is/are rejected.
- 7) ☒ Claim(s) 14 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/10/04</u> | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election without traverse of Group II, claims 1-15 in the reply filed on 10/26/05 is acknowledged.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-13,15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Background of the invention in view of Oh et al..

Background of the invention, figs. 1A-1C and related text on pages 1-2 of the instant specification teaches the conventional method for forming a cylindrical capacitor using a single mold including the steps of forming an insulating layer 20 over a semiconductor substrate 10; forming a contact plug 25 in the insulating layer 20; sequentially forming an etch stopping layer 30 of nitride, a single sacrificial oxide layer 40 of BPSG (see corresponding to fig. 8B, layers 61 and 64 of US 6,459,112, col. 14, lines 51-55) over the surface of the semiconductor substrate 10 having the contact plug 25; patterning the single sacrificial oxide layer 40 until a portion of the etch stopping layer 30 over the contact plug 25 is exposed to form a capacitor hole (fig. 1B); etching the exposed portion of the etch stopping layer 30 until an upper portion of the contact plug 25 is exposed to form a final capacitor hole including exposing a portion of the

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insulating layer adjacent to the contact plug; cleaning the semiconductor substrate having the final capacitor hole to remove a native oxide film on the exposed upper portion of the contact plug 25 by HF-based wet etching (col. 14, last two paragraphs of US 6,549,112); forming a lower electrode, dielectric layer and upper electrode in the capacitor hole to complete the capacitor structure (fig. 9B in US 6,459,112).

Background of the invention lacks anticipation of using upper and lower sacrificial oxide layers which will be etched into a double mold for fabrication of a lower capacitor electrode.

Oh et al., in a related method for forming a cylindrical capacitor as shown in figs. 6-20 and related text on col. 4-12, teaches the use of upper and lower mold of sacrificial oxide layer 135 and 130 formed over etch stopping layer 120 (fig. 6); the lower sacrificial oxide layer 130 is isotropically etched after contact hole was formed (in fig. 7) to form an expanded capacitor hole therein (fig. 8).

With respect to claims 3-5, Oh et al. teaches the use of lower sacrificial oxide layer 130 selected from BPSG, PSG which has a faster etching rate than the upper sacrificial oxide layer 135; and upper sacrificial oxide layer is formed from PE-TEOS (col. 4, last three paragraphs).

With respect to claims 6, 7, see Oh et al., col. 6, second paragraph.

With respect to claims 8-12, see Oh et al., fig. 13.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used lower and upper sacrificial oxide layers with different etching rates for forming double mold as suggested by Oh et al. in the conventional

process of forming a cylindrical capacitor disclosed in the Background of the invention in order to increase the surface area which, in turn, increase the capacitance and prevent an electrical bridge between the lower electrodes.

***Allowable Subject Matter***

Claim 14 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: None of the references of record teaches or suggests the claimed method for forming a capacitor including isotropically etching the lower sacrificial oxide layer before etching the exposed portion of the etch stopping layer.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hwang et al. discloses the use of double molding layer for forming lower capacitor electrode.

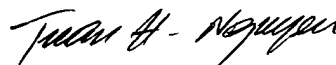
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan H. Nguyen whose telephone number is 571-272-1694. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tuan H. Nguyen  
Primary Examiner  
Art Unit 2813